# Air quality

# Monitoring, Forecasting, and Management

**Augustin Colette**

**INERIS: Experts in Environmental and Industrial Risks**

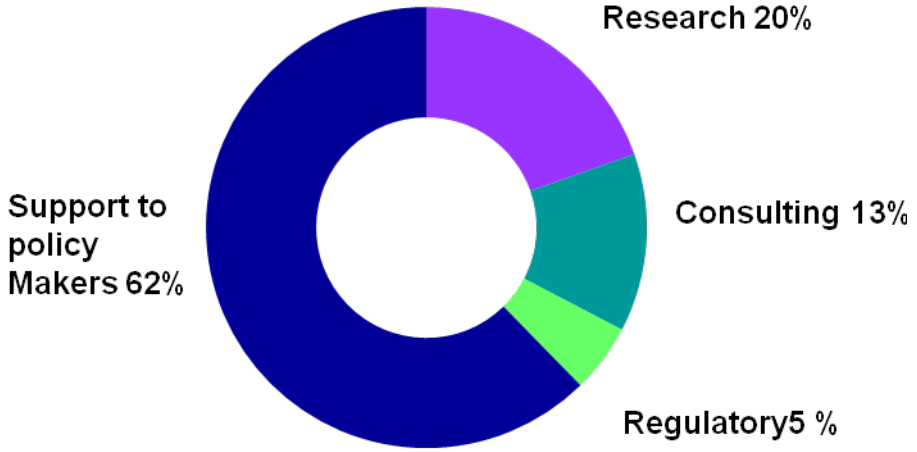
**Chronic Risks Division / GIS and Air Quality Modelling Unit**

augustin.colette@ineris.fr

INERIS
maîtriser le risque
pour un développement durable

# INERIS

- National Institute for Industrial Environment and Risks
- Assessment and prevention of technological and environmental risks
- Created in 1990, 600 people, 70M€
- “Public institute of an industrial and commercial character”: not subsided, under the supervision of the French Ministry of the environment




INERIS
maîtriser le risque pour un développement durable

# Risk Assessment

Accidents

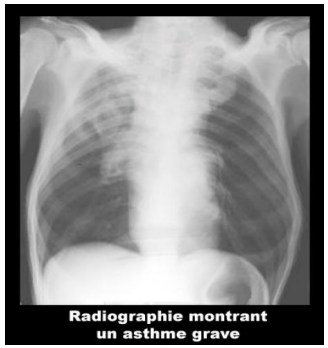
**Risk** = hazard x probability x impacts



Health and Environment

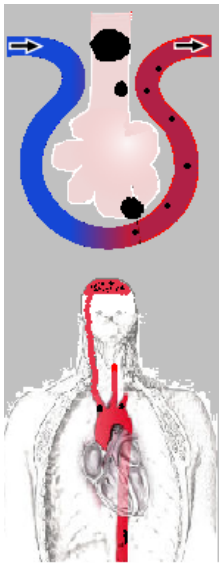
**Risk** = toxicity x exposure x impacts



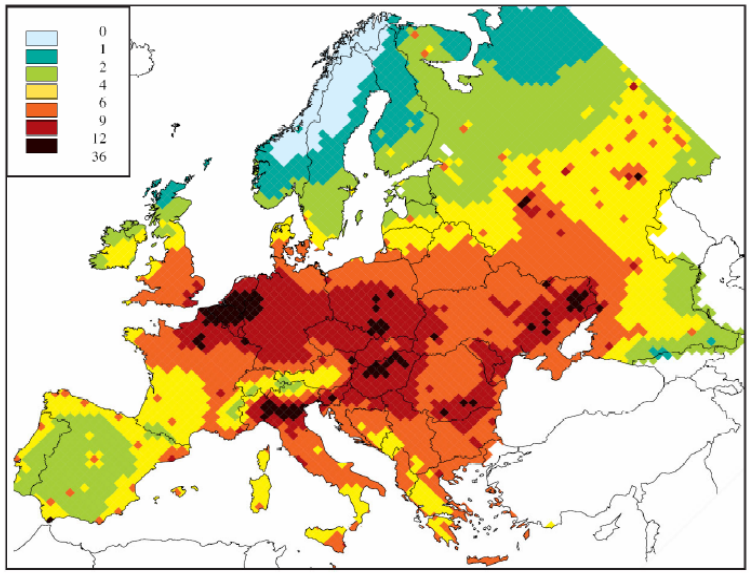




INERIS
maîtriser le risque
pour un développement durable

# Air Pollution : Impacts on Health



**Loss in life expectancy attributable to exposure to fine particulate matter - 2000**




IIASA

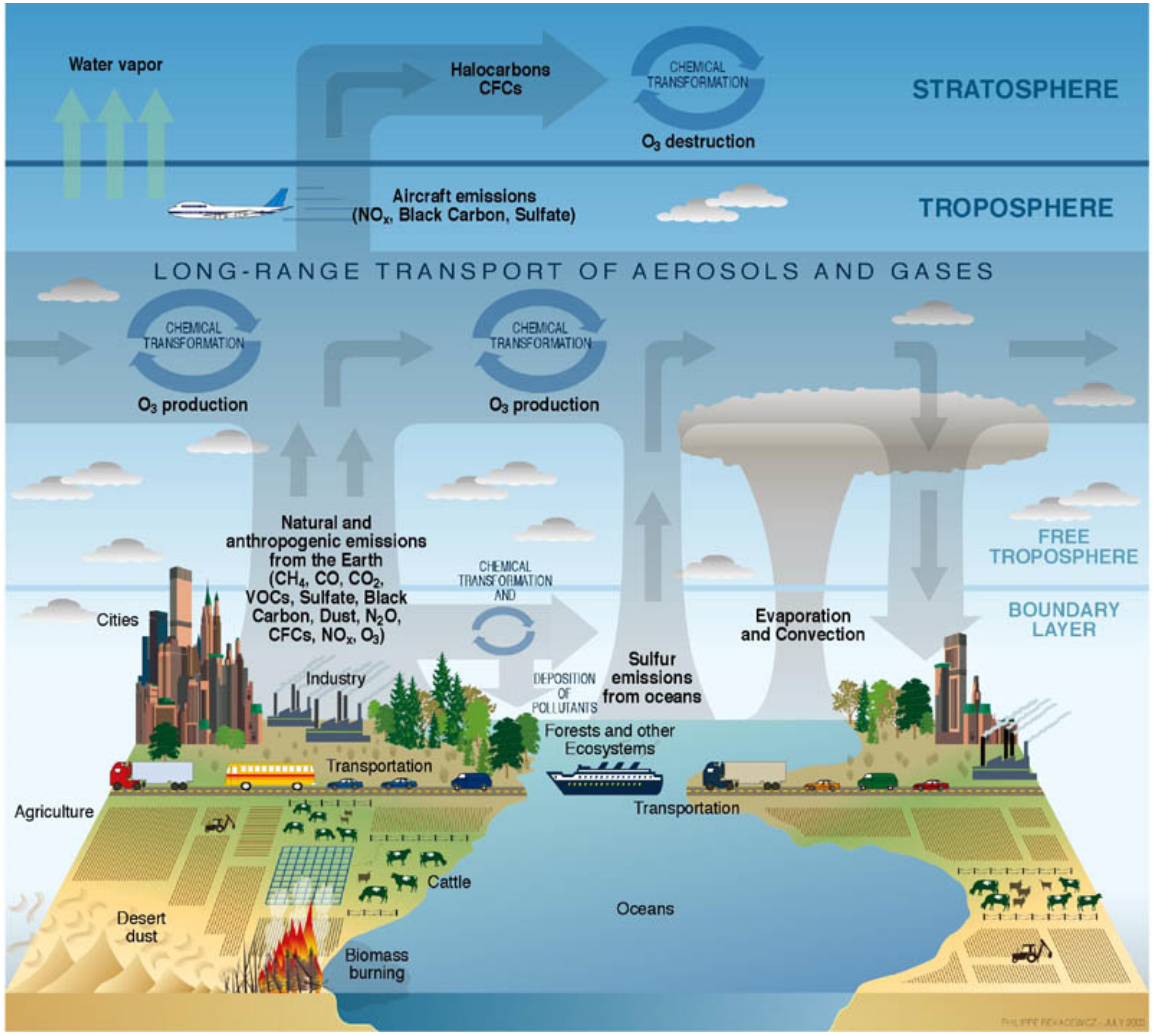
INERIS
maîtriser le risque
pour un développement durable

# Air Quality

Forecasting

Emergency response

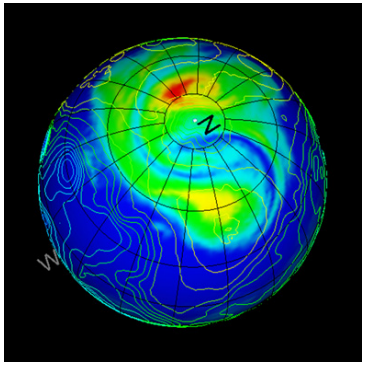
Management



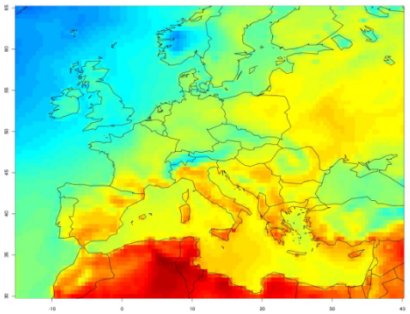

INERIS
maîtriser le risque pour un développement durable

# Regional Chemistry Transport Modelling

Global Atmospheric Circulation Model

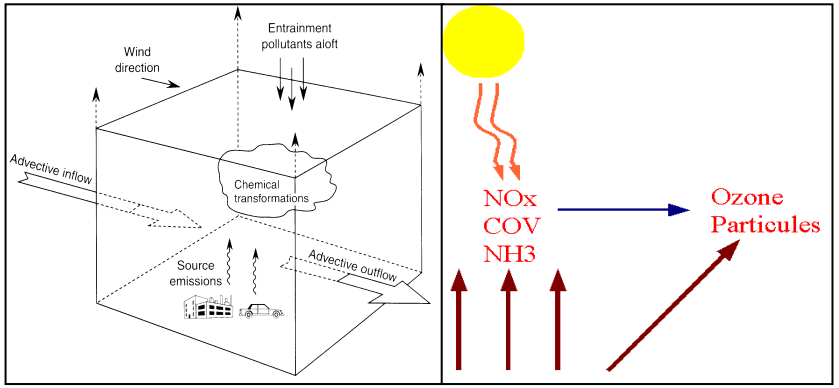


Regional Meteorology



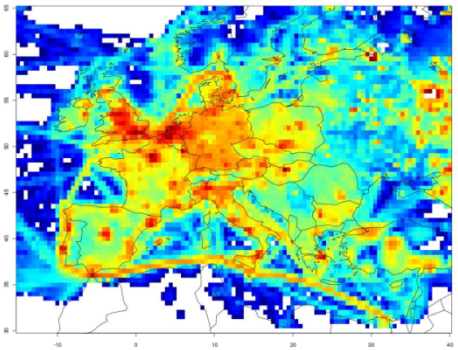
**Transport**
Advection
Turbulent mixing

**Chemistry**
Photochemistry
Aerosol formation

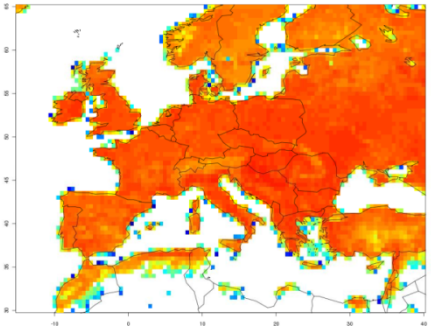



Ozone
Particulate Matter

Anthropogenic Emissions of Reactive species



Biogenic Emissions of Reactive species



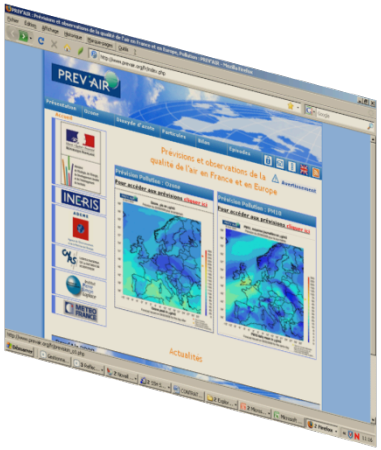
INERIS
maîtriser le risque pour un développement durable

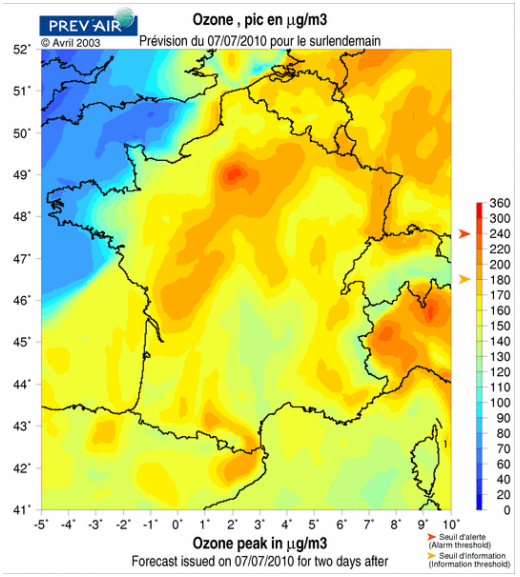
## Operational forecasting

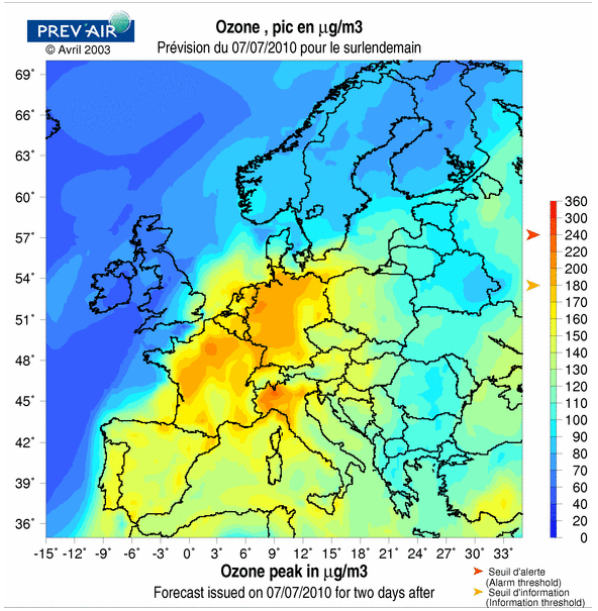
- www.prevair.org

## Targetted species:

- Ozone
- Particulate Matter



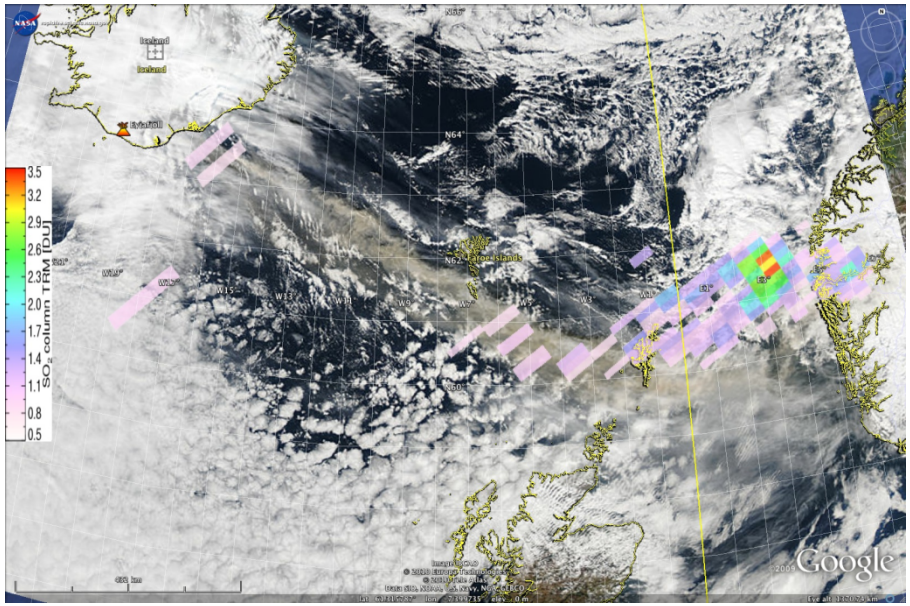




Ozone forecast
Friday 9th July

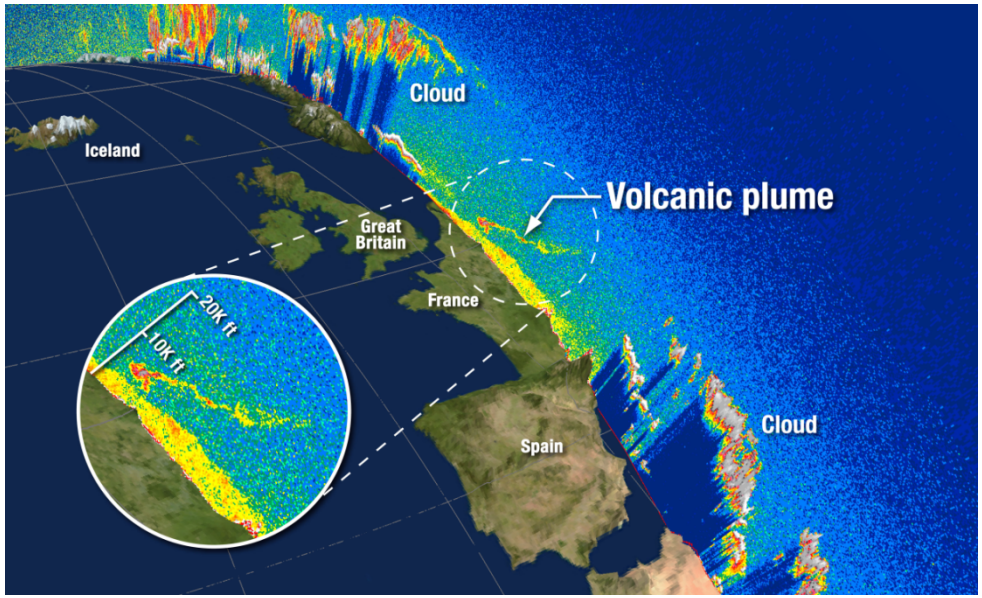
INERIS
maîtriser le risque pour un développement durable

# Emergency Response

# Eyjafjallajökull Eruption


Composite of Aqua/MODIS visible image and OMI SO2 data. April 15

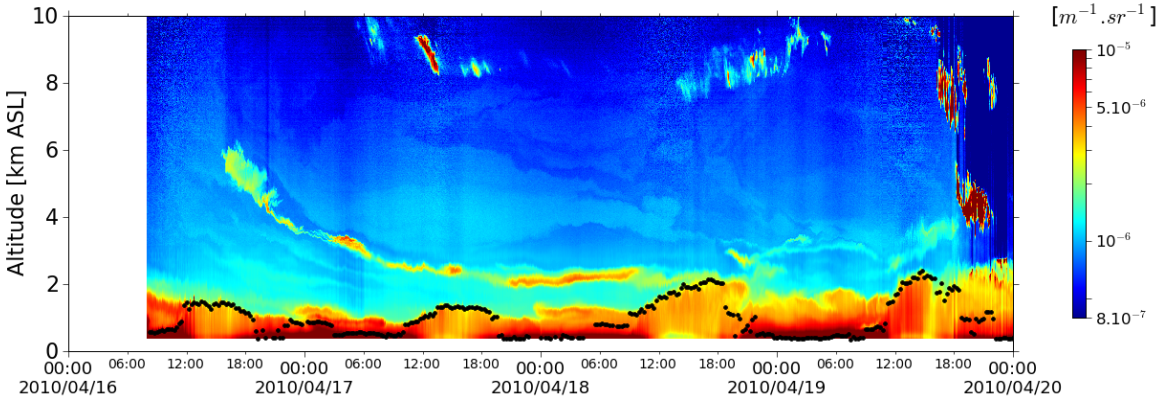



Calipso, April 17

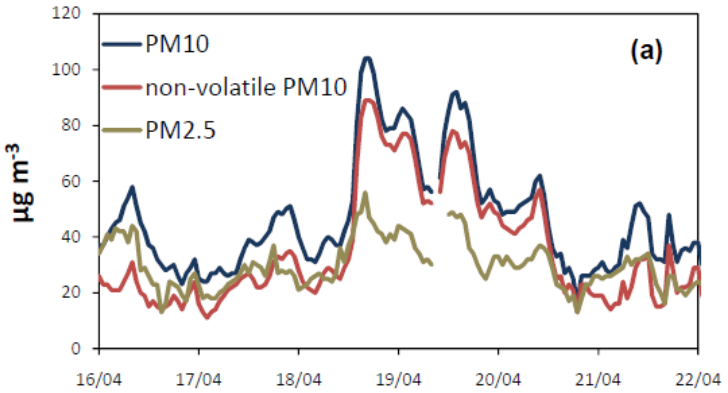
INERIS
maîtriser le risque pour un développement durable

# Ash plume monitoring & modelling

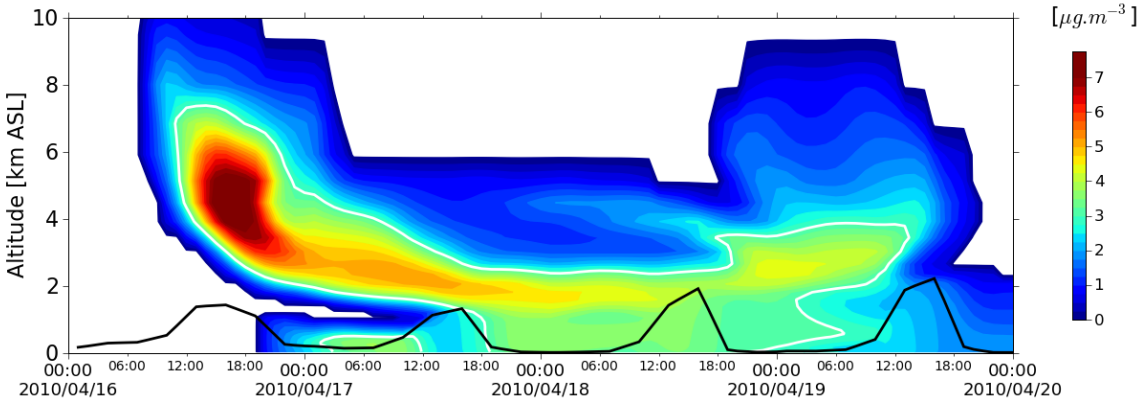
Up to 30% of total observed PM10 (reaching 65µg/m3) is attributed to the volcanic plume



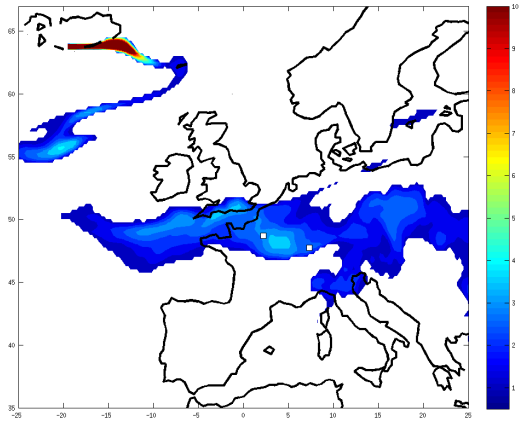

Lidar probing of the ash layer, SIRTA, Paris, April 2010




Observed PM10 in NE France




Modelled vertical column of volcanic tracers at SIRTA, Paris, April 2010



Modelled spread of the ash plume at the surface

INERIS
maîtriser le risque pour un développement durable

# AQ Management

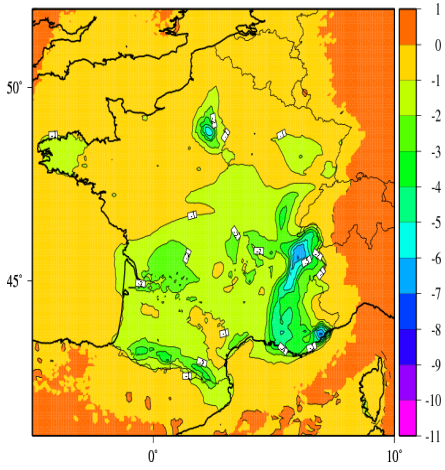
# Scenarios



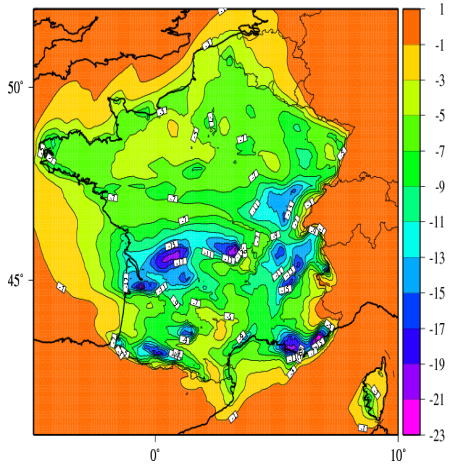
## Support to policy makers in the design of air quality management strategies

- PM10 reduction (%) compared to a reference simulation, winter 2009
- Assessment of traffic restrictions with emissions for only half of normal traffic
- Assessment of the impact of the removal of the residential wood combustion

traffic




wood burning

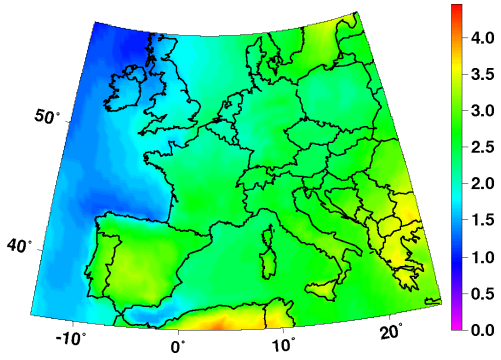



INERIS
maîtriser le risque
pour un développement durable

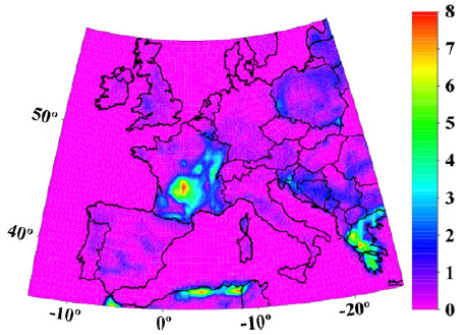
# Future projections

## Comparison 1985-1990 vs 2075-2080

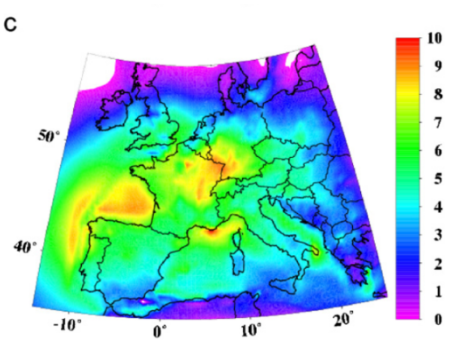
- Climate change:
  - Temperature, cloudiness, precipitation
- AQ impact
  - Photochemistry
  - Deposition, Erosion, Mixing
  - Availability of precursors
- Anthropogenic emission scenarios
  - In progress



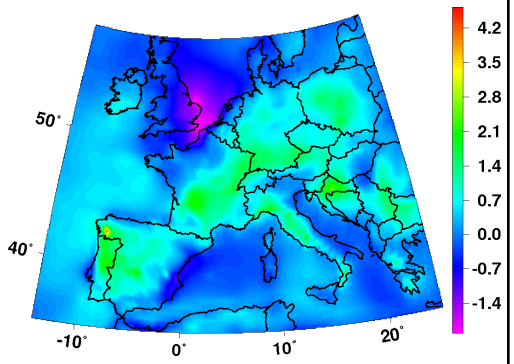

Surface temperatures (K)




Biogenic emissions (ppb)




Summer Surface ozone (ppb)

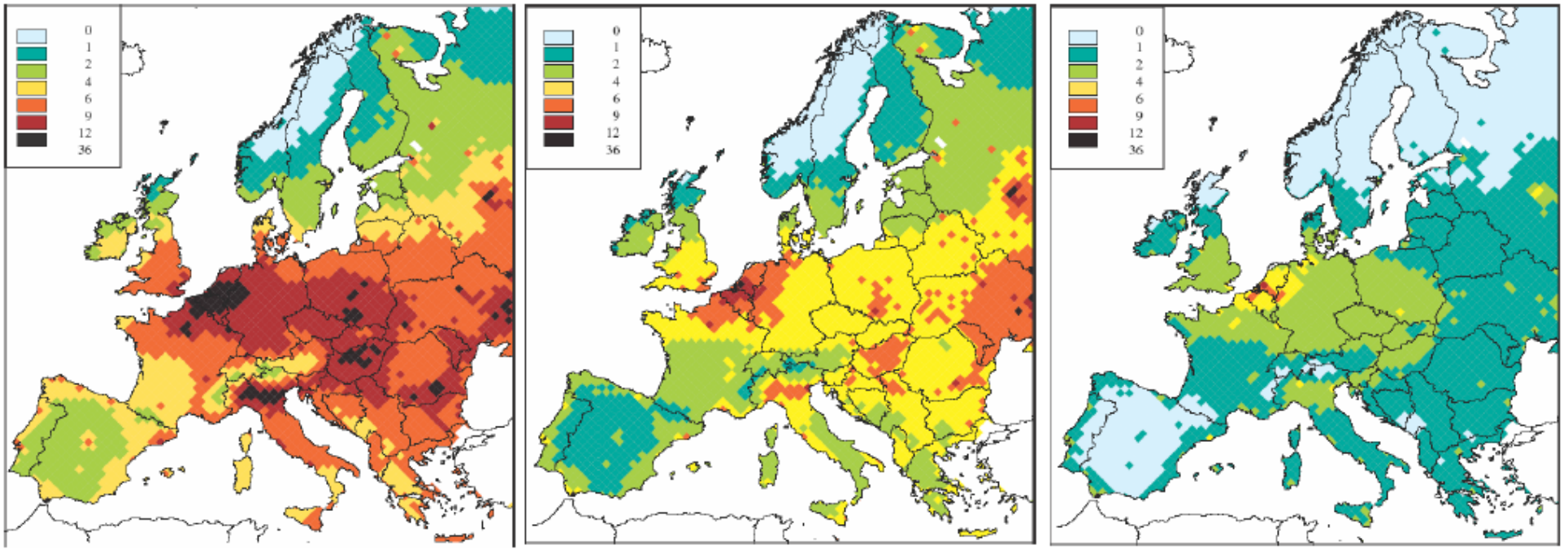



Annual Surface PM10 (µg/m3)

INERIS
maîtriser le risque pour un développement durable

# EU regulation

## Regulation and consequences on life expectancy loss




2000

2020
Current legislation

2020
Max. feas. reductions

IIASA

INERIS
maîtriser le risque
pour un développement durable